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RT2 COMBAT SAMPLES APRIL 2000



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RT2 COSAGE BOARDS

SUMMARY

THE PROJECT PURPOSE was to develop combat samples that reflect the US, Allied, and Threat forces in Illustrative Planning Scenario Regional Threat 2 (IPS RT2).

THE PROJECT SPONSOR was the Commander, Air Force Studies and Analysis Agency (AFSAA).

THE PROJECT OBJECTIVES were to:

- (1) Adequately reflect force structure and equipment.
- (2) Adequately reflect doctrinal missions.
- (3) Adequately reflect system-level performance.

THE SCOPE OF THE PROJECT is the IPS RT2 scenario.

THE MAIN ASSUMPTION was that the Combat Sample Generator (COSAGE) Model stylized division adequately represents the theater for in-combat samples.

THE PRINCIPAL FINDING is that COSAGE IPS RT2 boards' combat samples adequately model the scenario.

THE PRINCIPAL RECOMMENDATIONS are to:

- (1) Verify the combat samples in the Concepts Evaluation Model (CEM).
- (2) Provide the combat samples to AFSAA.
- (3) Provide the combat samples to the Office of the Secretary of Defense (OSD), when requested.

THE PROJECT EFFORT was conducted by MAJ Mike Mahony and CPT Rob Shearer, Operational Capability Assessments - Northeast Asia, Center for Army Analysis (CAA).

COMMENTS AND QUESTIONS may be sent to the Director, Center for Army Analysis, ATTN: CSCA-NE, 6001 Goethals Road, Suite 102, Fort Belvoir, VA 22060-5230.

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1 INTRODUCTION

MAJ Mike Mahony and CPT Rob Shearer, Operational Capability Assessments - Northeast Asia (OCA-NEA), jointly created the RT2 COSAGE boards. MAJ Mahony developed the US force files, CPT Shearer developed the Allied force files, and both developed the Threat force files. The RT2 boards do not include any of the transformations to the US Army proposed by the Chief of Staff of the Army (CSA).

□ Introduction
□ Problem Statement
□ Scope
☐ Essential Elements of Analysis
☐ Measures of Effectiveness
□ Analysis
□ Summary
□ Recommendation

Figure 1. Agenda

Figure 1 presents the agenda followed for this report.

Develop combat samples to model the IPS - RT2

Figure 2. Problem Statement

The problem statement is as shown in Figure 2 above.

1.3 Essential Elements of Analysis

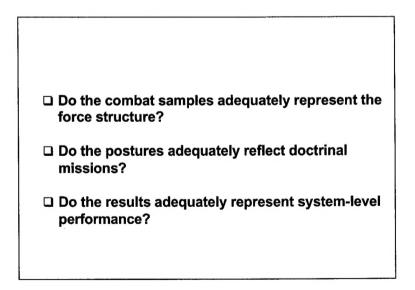


Figure 3. Essential Elements of Analysis

Figure 3 presents the standard Combat Sample Generator (COSAGE) essential elements of analysis (EEA).

1.4 Measures of Effectiveness for Essential Elements of Analysis

- □ Do the combat samples adequately reflect the force structure and equipment?
 - Stylized force: proportional representation of theater forces in a "division" (equipment, weapons, munitions)
- ☐ Do the postures adequately represent doctrinal missions?
 - FER (force exchange ratio)
 - LER (loss exchange ratio)
 - SER (system exchange ratio)
- ☐ Do the results adequately represent system-level performance?
 - Interactions
 - Kills per shot
 - Shots per system per day

Figure 4. Measures of Effectiveness for Essential Elements of Analysis

Figure 4 lists the standard COSAGE measures of effectiveness for the essential elements of analysis.

□ Study Evolution
☐ Input Data Analysis
☐ Output Data Analysis
□ Summary
□ Recommendation

Figure 5. Analysis

Figure 5 above indicates the standard COSAGE analysis methodology.

1.6 Study Evolution

Study Evolution

- ☐ TAA-07- RT2 changes
 - Forces
 - ✓ New Threat force
 - ✓ Updated US, Allied forces
 - Model
 - ✓ Updated weapon rates of fire
 - ✓ Updated SSPK files

Figure 6. Study Evolution

Total Army Analysis-2007 Northeast Asia (TAA-07 NEA) was utilized as the base case from which the RT2 files were created. TAA-07 NEA US and Allied forces closely resemble the same forces in RT2. These forces were modified to match the forecast RT2 theater forces. RT2 also included COSAGE Model changes that were not included in the TAA-07 NEA boards. These include new single shot probability of kill (SSPK) files and updated weapon rates of fire.

I.7 Input Data Analysis □ Force postures □ Major weapon system highlights ● US ● Allied ● Red □ Major weapon system quantities ● US ● Allied ● Red □ Allied ● Red

Figure 7. Input Data Analysis

Input data analysis shown in Figure 7 focused on relating COSAGE postures to the RT2 concept of operations as well as significant major weapon systems of all forces.

1.8 Force Postures vs IPS RT2

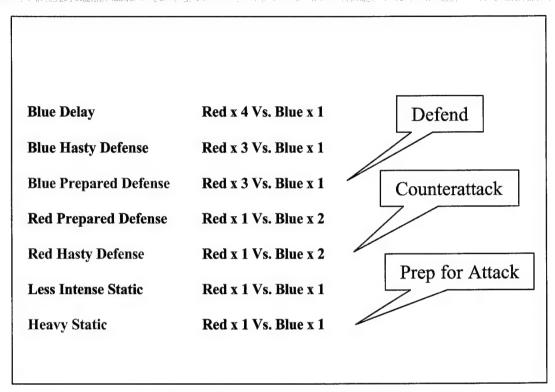


Figure 8. Force Postures vs IPS RT2

COSAGE boards contain seven postures, and these seven fall into three categories--Blue attack, static, and Blue defend. Analysis for RT2 focused on one posture from each category, as highlighted in Figure 8 above.

1.9 US Major Weapon Systems Highlights

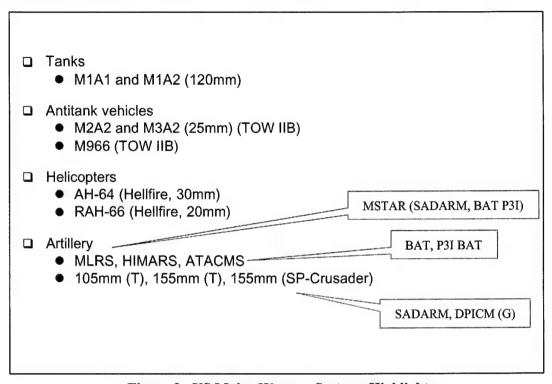


Figure 9. US Major Weapon Systems Highlights

The major additions to the US force in RT2 from TAA-07 NEA were the precision guided munitions (PGM) added to the multiple launch rocket system (MLRS), High Mobility Artillery Rocket System (HIMARS), Army Tactical Missile System (ATACMS), and 155mm howitzers.

1.10 Allied Major Weapon Systems Highlights

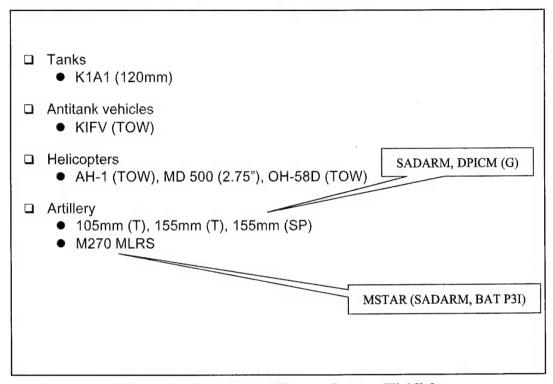


Figure 10. Allied Major Weapon Systems Highlights

The major additions to the Allied force in RT2 from TAA-07 NEA were the precision guided munitions added to MLRS and 155mm howitzers.

1.11 Threat Major Weapon Systems Highlights

□ Tanks

 T90 (120mm), T80 (105mm), T59 (100mm)

 □ Antitank Vehicles

 BMP3 (100mm, AT-10), YW531 (Red Arrow 8)

 □ Helicopters

 EC-120 (Red Arrow 8)

 □ Artillery

 107mm, 122mm, 130mm MRL, SCUD
 122mm (T) (SP), 130mm (T) (SP), 152mm (T) (SP) Howitzers

Figure 11. Threat Major Weapon Systems Highlights

Threat forces in RT2 and TAA-07 NEA are significantly different--RT2 Threat forces are more mobile as well as more modern.

1.12 US Major Weapon Systems Quantities

<u>US</u>	System	TAA-07	RT2
Tanks			
	M1A1	120	10
	M1A2	128	237
AT			
	M2A3	204	191
	M3CFV	36	62
	HMMWV TOW IIB	50	61
Helicopter			
	AH-64	54, 12 (L)	29, 17 (L)
	RAH-66	0	18
Artillery			
	105mm (T)	30	22
	155mm (T)	48	13
	155mm (SP)	24, 60 (Paladin)	97 (Crusader)
	HIMARS	0	24
	MLRS	72	31
	ATACMS	9	9

Figure 12. US Major Weapon Systems Quantities

US systems in RT2 are similar to those in TAA-07 NEA, with some modernization, as shown in Figure 12.

1.13 Allied Major Weapon Systems Quantities

K1A1 224 203 AT KIFV-TOW 70 263 Helicopters AH-1S 9 15 MD 500 12 24 OH-58D 6 8 AH-64A 8 0 Artillery 105mm (T) 64 20 155mm (T) 160 60 155mm (SP) 112, 20 (Paladin) 224	AT KIFV-TOW 70 263 Helicopters AH-1S 9 15 MD 500 12 24 OH-58D 6 8 AH-64A 8 0 Artillery
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155mm (SP) 112, 20 (Paladin) 224	
155mm (SF) 112, 20 (1 aladm) 224	
MLRS M270 12 44	MLRS M270 12 44
MERS M270 12 44	WENS 112/0 12 44

Figure 13. Allied Major Weapon Systems Quantities

Allied forces in RT2, shown in Figure 13, are also similar to those in TAA-07 NEA, with some modernization.

1.14 Threat Major Weapon Systems Quantities

Threat	System	TAA-07	RT2
Tanks			
	T55 / T59	65	182
	T62 / T80	52	40
	T62C / T90	39	78
AT			
	M1973 / BMP3	90	92
	M1992 / YW531	24	120
Helos			
	Hoplite/EC-120	18	5
	MD 500	12	0
Artillery			
•	107 MRL	56	6
	122 MRL	48	17
	130 MRL	0	43
	122mm (T)	0	149
	122mm (SP)	126	23
	130mm (T)	64	50
	152mm (SP)	120	12
	170mm (SP)	24	35
	SCUDS	9	27

Figure 14. Threat Major Weapon Systems Quantities

Threat systems differ greatly from TAA-07 NEA to RT2, as shown in Figure 14. Systems separated above by a slash show the TAA-07 system on the left and the RT2 system on the right, e.g., T55s fought in TAA-07, T59s fought in RT2.

1.15 Output Data Analysis

- Defend
 - Allied systems
 - ✓ K1A1 120mm cannon
 - ✓ KIFV TOW IIA
 - US systems
 - ✓ AH-64A / AH-64D Hellfire
 - ✓ RAH-66 Hellfire
 - Threat systems
 - ✓ T90 125mm cannon
 - ✓ BMP3 100mm cannon
- □ Counterattack
 - US systems
 - √ M1A1 / M1A2 120mm cannon
 - ✓ M2A3 BFV TOW IIB
 - ✓ AH-64A / AH-64D Hellfire
 - ✓ RAH-66 Hellfire
 - Threat systems
 - ✓ T80 105mm cannon
 - ✓ YW531 Red Arrow 8

Figure 15. Output Data Analysis

Output data analysis focused on significant US, Allied, and Threat systems in the defend and counterattack phases of the operation, as shown in Figure 15 above.

□ US indirect fire engagements□ FER / LER comparisons□ Kills by systems	Data Analysis (continued)
□ FER / LER comparisons	□ US indirect fire engagements
□ Kills by systems	
	□ Kills by systems

Figure 16. Output Data Analysis (continued)

Output data analysis also focused on US indirect fire engagements, force/system performance ratios, and percentage of kills by systems.

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2 THE DEFEND PHASE

2.1 Allied: KM1A1 (120mm)

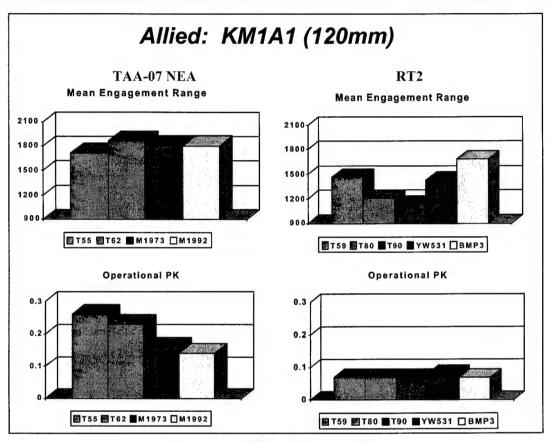


Figure 17. Allied: KM1A1 (120mm)

Analysis of the defend phase begins with the Allied KM1A1 tank as shown in Figure 17. The same system exists in both TAA-07and RT2, but the systems that it targets differ by study. Mean engagement ranges decreased for the KM1A1 due to the minimum SSPK function used in RT2. The expected increase in operational PKs for RT2 failed to occur for two reasons: (1) updated weapon rates of fire from TAA-07 to RT2, leading to a higher number of hits on dead targets, and (2) more advanced systems in RT2.

2.2 Allied: KIFV (TOW IIA)

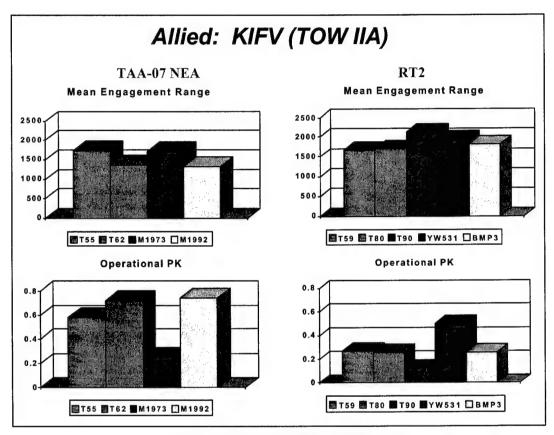


Figure 18. Allied: KIFV (TOW IIA)

The defend phase analysis continues with the Allied Korean infantry fighting vehicle (KIFV) (TOW IIA). The same system exists in both TAA-07and RT2, but the systems that it targets differ by study. Mean engagement ranges changed little in response to the minimum SSPK function used in RT2, since the TOW IIA SSPK curve is relatively flat. Operational PKs decreased due to updated tube-launched, optically tracked, wire-guided (TOW) missile SSPK values for RT2 that were only 70 percent of the TAA-07values.

2.3 US: AH-64D (Hellfire)

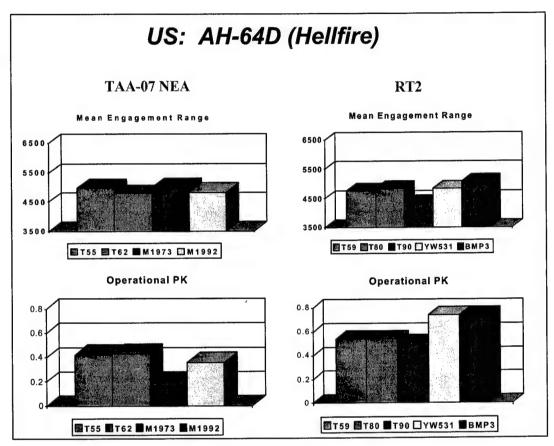


Figure 19. US: AH-64D (Hellfire)

The next system addressed in the analysis of the defend phase is the US Apache Longbow. The same system exists in both TAA-07 and RT2, but the systems that it targets differ by study. Mean engagement ranges changed little in response to the minimum SSPK function used in RT2, since the Hellfire SSPK curve is relatively flat. Operational PKs increased due to the new improved aviation algorithm incorporated into the COSAGE Model in January 2000.

2.4 US: RAH-66 (Hellfire)

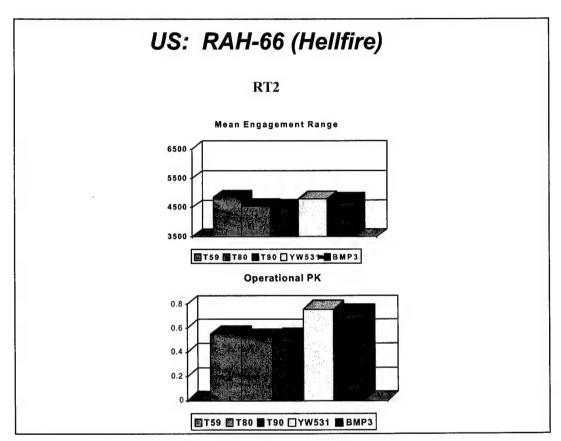


Figure 20. US: RAH-66 (Hellfire)

Analysis of the defend phase continues with the US Comanche. This system does not exist in TAA-07, and no similar counterpart exists. Mean engagement ranges and operational PKs are similar to those of the Apache on Figure 19, as expected.

2.5 Threat: T62 (105mm)T90 (125mm)

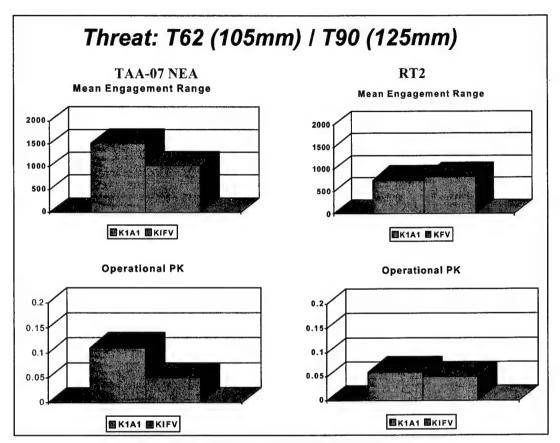


Figure 21. Threat: T62 (105mm)/T90 (125mm)

The Threat T90 tank is the next system examined in the defend phase. The same system does not exist in TAA-07. Comparisons are made against the T62, the best Threat tank in TAA-07. Mean engagement ranges decreased due to the minimum SSPK function used in RT2. The expected increase in operational PKs for RT2 failed to occur due to the updated weapon rates of fire, leading to a higher number of hits on dead targets.

2.6 Red: M1992 (AT3)/BMP3 (100mm)

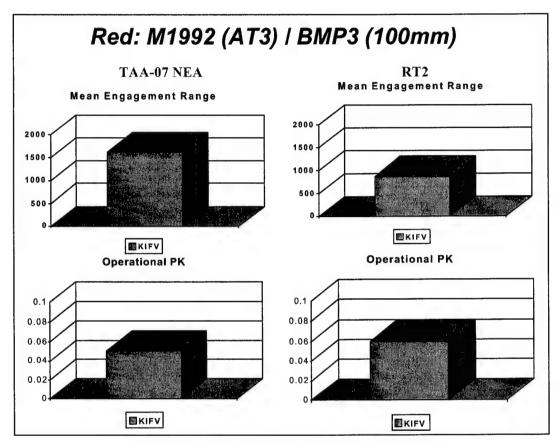


Figure 22. Red: M1992 (AT3)/BMP3 (100mm)

The defend phase analysis continues with the Threat BMP3 (100mm). The same system does not exist in TAA-07. Comparisons are made against the M1992, the best Threat IFV in TAA-07. Mean engagement ranges decreased due to the minimum SSPK function used in RT2. Operational PKs increase due to closer engagement ranges and higher SSPKs for the BMP3.

3 COUNTERATTACK

3.1 US: M1A2 (120mm)

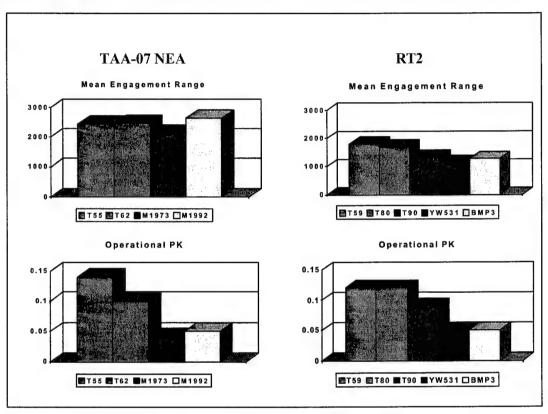


Figure 23. US: M1A2 (120mm)

Analysis of the counterattack phase begins with the US M1A2 tank (Figure 23). The same system exists in both TAA-07 and RT2, but the systems that it targets differ by study. Mean engagement ranges decreased for the M1A2 due to the minimum SSPK function used in RT2. The expected increase in operational PKs for RT2 was dampened by two factors: (1) updated weapon rates of fire from TAA-07 to RT2, leading to a higher number of hits on dead targets, and (2) more advanced systems in RT2.

3.2 US: M2A3 (TOW IIB)

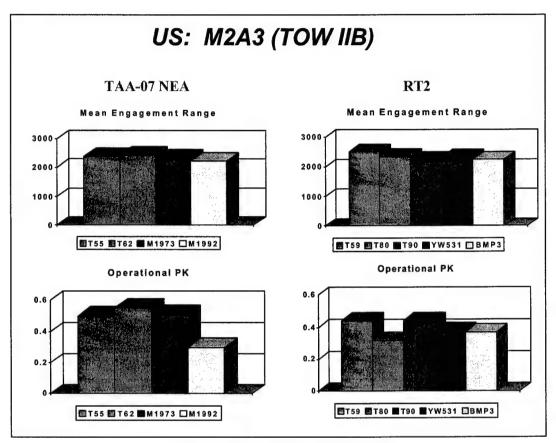


Figure 24. US: M2A3 (TOW IIB)

Analysis of the counterattack phase continues with the US M2A3 (TOW IIB). The same system exists in both TAA-07 and RT2, but the systems that it targets differ by study. Mean engagement ranges changed little in response to the minimum SSPK function used in RT2 since the TOW IIA SSPK curve is relatively flat. Operational PKs decreased due to updated RT2 TOW SSPK values that were only 70 percent of the TAA-07 values.

3.3 US: AH-64D (Hellfire)

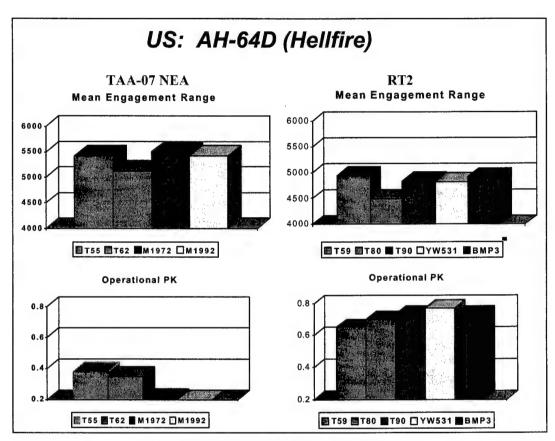


Figure 25. US: AH-64D (Hellfire)

The US Apache Longbow is the next system analyzed in the counterattack phase. The same system exists in both TAA-07 and RT2, but the systems that it targets differ by study. Mean engagement ranges changed little in response to the minimum SSPK function used in RT2, since the Hellfire SSPK curve is relatively flat. Operational PKs increased due to the improved aviation algorithm incorporated into the COSAGE Model in January 2000.

3.4 US: RAH-66 (Hellfire)

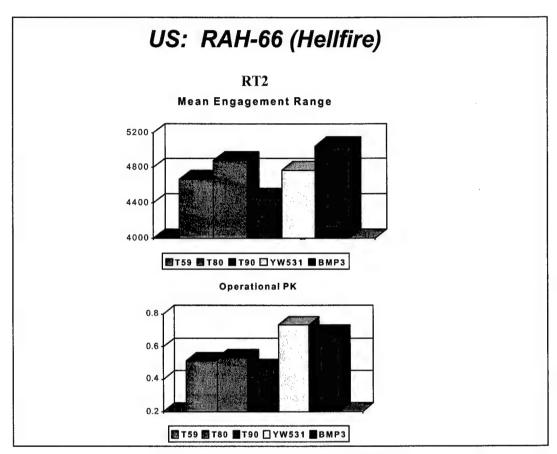


Figure 26. US: RAH-66 (Hellfire)

The counterattack phase continues with analysis of the US Comanche. This system does not exist in TAA-07, and no similar counterpart exists. Mean engagement ranges and operational PKs are similar to those of the Apache shown on Figure 25, as expected.

3.5 Red: T55 (100mm)/T80 (105mm)

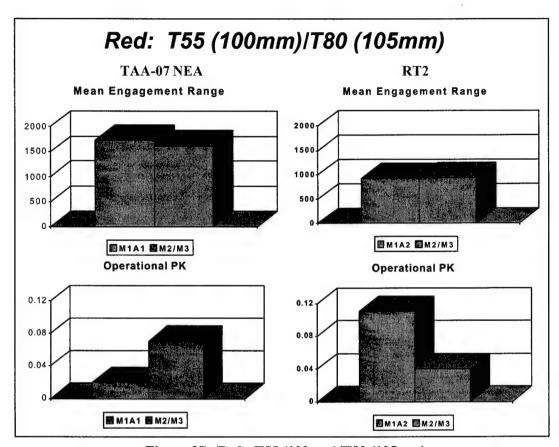


Figure 27. Red: T55 (100mm)/T80 (105mm)

Analysis of the counterattack phase continues with the Threat T80 tank. This system does not exist in TAA-07, so comparisons are made against the T55. Mean engagement ranges decreased due to the minimum SSPK function used in RT2. Operational PKs increased due to higher SSPKs and smaller mean engagement ranges for the T80.

3.6 Red: M1974\3 (AT3)/YW 531 (RA 8)

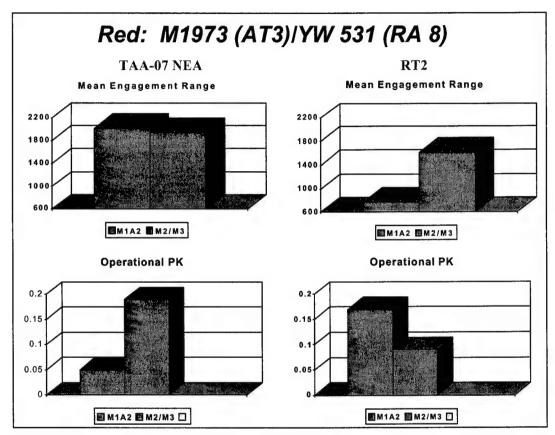


Figure 28. Red: M1973 (AT3)/YW 531 (RA 8)

Data for the counterattack phase continues with the Threat YW 531 (Red Arrow 8 ATGM). The same system does not exist in TAA-07, so comparisons are made against the M1973, which also carries an antitank guided missile (ATGM) (AT3). Mean engagement ranges decreased due to the minimum SSPK function used in RT2. Operational PKs remained unchanged since updated rates of fire cancelled out higher SSPKs.

3.7 US Indirect Fire (rounts/tube/day)

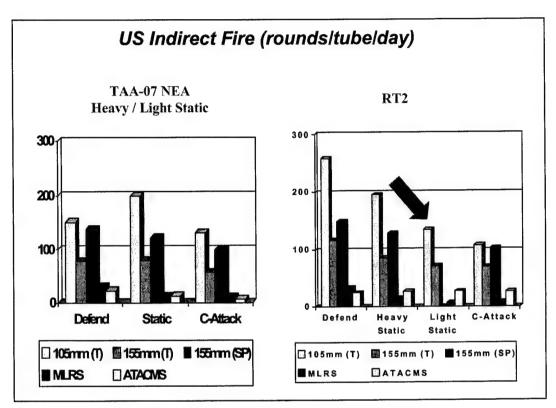


Figure 29. US Indirect Fire (rounds/tube/day)

Rates of fire for US indirect fire systems remain relatively constant from TAA-07 to RT2. The new systems in RT2 included Crusader and HIMARS. The new munitions in RT2 included MSTAR1/MSTAR 2 for the MLRS/HIMARS, brilliant antitank (BAT)/BAT2 for ATACMS, and sense and destroy armor (SADARM) for the Crusader. Preplanned artillery targets were removed from the RT2 light static posture, reducing the number of artillery rounds fired.

3.8 LER Comparison

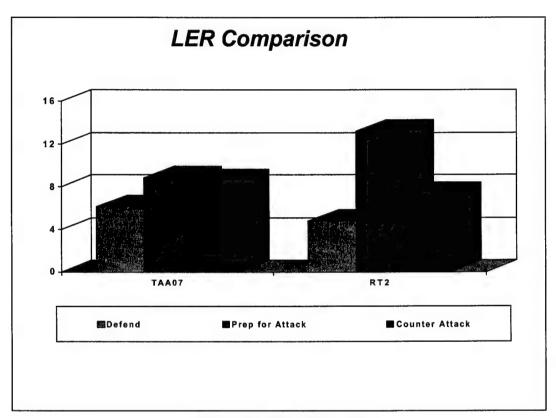


Figure 30. LER Comparison

As shown in Figure 30, LER patterns remained constant across both studies.

3.9 FER Comparison

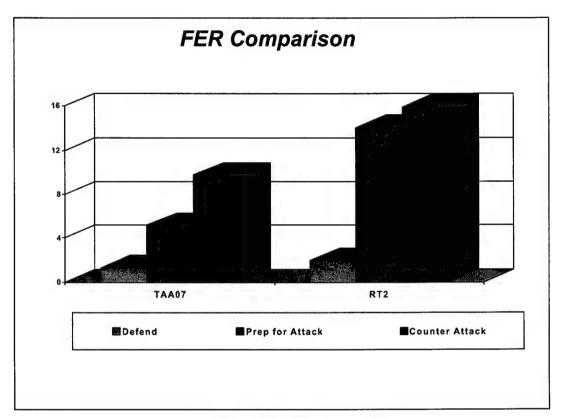


Figure 31. FER Comparison

FER patterns remained constant across both studies, as shown in Figure 31 above.

3.10 Kills by System

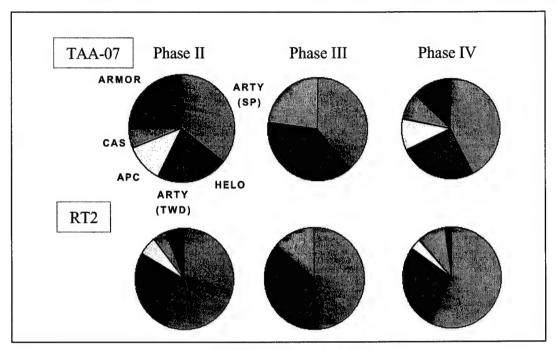


Figure 32. Kills by System

The addition of the PGMs in RT2 led to an increased percentage of kills by artillery systems. These gains came largely from TAA-07 NEA armor kills that the antitank PGMs "stole" in RT2. Increased lethality in attack aviation prevented "stealing" of attack aviation kills by artillery in RT2.

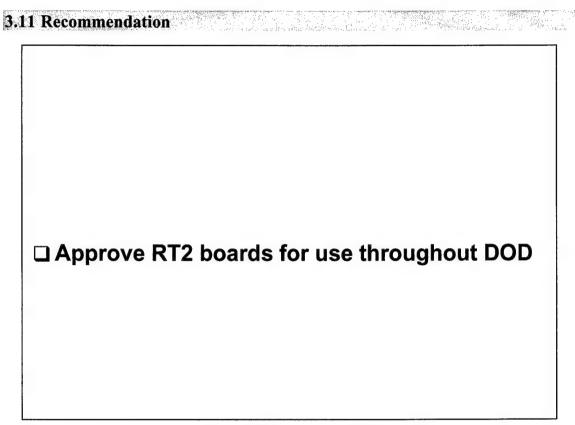


Figure 33. Recommendation

Mr. E. B. Vandiver, Director, CAA, approved the release of RT2 boards on 7 April 2000.

CAA-R-00-20

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APPENDIX A. PROJECT CONTRIBUTORS

1. PROJECT TEAM

a. Project Directors

MAJ Mike Mahony and CPT Rob Shearer, Operational Capability Assessments - Northeast Asia

2. PRODUCT REVIEW

Mr. Ron Iekel, TQM Specialist

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APPENDIX B. REQUEST FOR ANALYTICAL SUPPORT

Performing Division:	NE	Account Number:	97066
Tasking: Verbal		Mode (Contract-Yes/No):	No
Acronym: COSAGE-	RT2 (originally NPS	S-A)	
Title: COSAGE Samp	oles for RT2 (original)	y Near Peer Scenario Samp	les-Asia)
		-	-
		•	mated Funds:
Description/Abstract:			
Develop combat sam	ples in support of N	ear Peer Scenario - Asia f	or QDR analysis.
		ned Phone#:	301-295-1627
Background:			
Scope:			
Scope:			
Scope: Issues: Milestones:	Chief Signature: O	riginal Signed and Dated	Date:
Scope: Issues: Milestones:		0 0	Date:
Scope: Issues: Milestones: Signatures Division	rrence: Mr. Howard	G. Whitley	Date: Date:
	Tasking: Verbal Acronym: COSAGE- Title: COSAGE Samp Start Date: 15-Jan-97 Requestor/Sponsor (i.e. Resource Estimates c. Models to be Used Description/Abstract: Develop combat sam Study Director/POC Sign Study Director/POC: M If this Request is for an Extendired. See TAB C of the	Tasking: Verbal Acronym: COSAGE-RT2 (originally NPSS Title: COSAGE Samples for RT2 (originall Start Date: 15-Jan-97 Requestor/Sponsor (i.e., DCSOPS): DCSO Resource Estimates: a. Estimated c. Models to be Used: Description/Abstract: Develop combat samples in support of No Study Director/POC Signature: Original Sign Study Director/POC: MAJ James McMullin If this Request is for an External Project expecte Required. See TAB C of the Project Directors' G	Tasking: Verbal Mode (Contract-Yes/No): Acronym: COSAGE-RT2 (originally NPSS-A) Title: COSAGE Samples for RT2 (originally Near Peer Scenario Samp Start Date: 15-Jan-97 Estimated Completion Date Requestor/Sponsor (i.e., DCSOPS): DCSOPS Sponsor Date Resource Estimates: a. Estimated PSM: 6 b. Estimated Completion Date Resource Estimates: a. Estimated PSM: 6 b. Estimated PSM: 6 b. Estimated PSM: 6 b. Estimated PSM: 6 b. Estimated PSM: 7 b. Estimated PSM: 7 b. Estimated PSM: 8 b. Estimated Poet Peer Scenario - Asia for Study Director/POC Signature: Original Signed Phone#: Study Director/POC: MAJ James McMullin If this Request is for an External Project expected to consume 6 PSM or more Required. See TAB C of the Project Directors' Guide for preparation of a Formal Project Directors' Guide for preparation Directors' Guide for preparation Directors' Guide for preparation

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